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MAJOR OBSTETRIC INTERVENTIONS AMONG ENCAMPED REFUGEES AND THE LOCAL POPULATION IN TURKANA DISTRICT, KENYA
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MAJOR OBSTETRIC INTERVENTIONS AMONG ENCAMPED REFUGEES AND THE LOCAL POPULATION IN TURKANA DISTRICT, KENYA

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ABSTRACT

Background: **Maternal mortality in developing countries remains high due to lack of appropriate emergency obstetric care. Major obstetric intervention (MOI) rate can be used as an indicator of unmet obstetric needs and quality of care.**
Objectives: **Identify indications for major obstetric interventions, determine MOI rates and assess extent of unmet obstetric need for women in Turkana district, Kenya.**
Design: **Descriptive bi-directional study.**
Setting: **Turkana district: Kakuma Refugee Camp, Kakuma Catholic Mission and Lodwar District Hospitals.**
Subjects: **Four thousand two hundred and eighty encamped refugee women and 7,630 women from the host population delivering in Turkana district between January 1995 and September 1999.**
Data Sources: **Maternity registers, inpatient case notes and theatre registers.**
Main outcome measures: **Maternal mortality, perinatal mortality, major obstetric interventions, unmet obstetric need and length of stay.**
Results: **The subjects from the two study populations were similar with respect to age, parity and indications for surgical intervention. Caesarean section was the only major obstetric intervention. Overall, caesarean section rate was significantly higher among refugees than in the host population (3.1% versus 2.1%, $p<0.01$; CI 1.4-2.1). Maternal indications were the main reasons for c/s in both populations, with the c/s rate being higher for refugees than for local women (2.5% versus 1.7%). At least 0.8% of parturient women from the host population had unmet obstetric needs: this translates to 61 pregnant women who may have died or experienced birth-related complications over the study period. The mean length of hospital stay was much less for refugee women than for the host population (8.1 days versus 11.3 days).**
Conclusion: **Encamped refugee women in Kakuma have better obstetric care than those from the host population, and the level of unmet obstetric needs in the district is high. This imbalance could be reduced through resource sharing and integration of refugee health care services with that for the host population.**

INTRODUCTION

Maternal mortality remains high in many developing countries. On average, women in the low-income countries experience 550-650 deaths per 100,000 live births annually(1). However, there are wide disparities between countries. Recent estimates by WHO indicate a range of 200 per 100,000 live births (for Latin America) to 870 (for Africa)(2). The differences may be explained more by lack of emergency obstetric care than by lack of prenatal care. Maternal death rates are negatively correlated with a country's wealth: the poorer the country the higher the maternal mortality. This relationship underscores not only the importance of socioeconomic development, but also the capability to provide effective coverage of obstetric services. To ensure effective coverage of such services, we need to know to what extent maternal need is, or is not, met in a defined population or geographical area. Need in this context is defined in terms of health problems that require health care(3). It is, thus, an estimation based on professional judgement and current medical technology. Unmet need then refers to a discrepancy between what is considered as a need by the professional and what is actually covered by the services offered.

A number of problems may complicate pregnancy. These are: acute ante-natal or postpartum haemorrhage, absolute dystocia (cephalo-pelvic disproportion or foetal malpresentation), relative dystocia (breech, failure to

progress) or other maternal diseases such as eclampsia or hypertension. These problems may result in delivery-related mortality and morbidity. The sum of these problems corresponds to "obstetric need" as defined by health professionals. In order to avoid death or damage to the mother and child it may be necessary to perform a caesarean section or do an episiotomy. "Unmet obstetric need" then is reflected in the number of women who fail to receive necessary surgical intervention.

Many factors determine whether obstetric needs of a woman will be successfully met. There may be delays at different levels: due to lack of accessibility to emergency obstetric care (as a result of distance, communication infrastructure, acceptability and affordability of the services), health professionals delaying to undertake appropriate intervention (for those women who reach a hospital), and the health care system preventing the woman from receiving appropriate intervention (transfer delays, inability to identify the problem, use of traditional approaches). On the other hand in some circumstances, interventions may be performed without absolute medical indication. For instance, a caesarean section may be done where active labour management and a normal delivery could have been achieved, or based on the woman's preference (and sometimes the doctor's), thus resulting in unnecessary interventions. These factors may explain the large variations in caesarean section (c/s) rates reported: 1% in Morocco, 6-7% in the Netherlands or Japan, 25% in the USA and 30% in Southern Brazil(4-7). These factors render direct comparison of c/s rates inappropriate.

Whereas Caesarean sections prevent death and unfavourable sequelae in women who experience obstetric problems, the exact proportion of births that require a caesarean section is unknown. Some authors(8-10) have suggested a caesarean section rate of 5% as a minimum for meeting obstetric needs, while others have proposed a reference figure of 2%(7). In order to determine a rate for a given country, it is necessary to use, as reference, a population of women where access to emergency obstetric care is guaranteed. Encamped refugees with specific health services established parallel to those for the host population present appropriate context for examining obstetric needs of women from the refugee and host populations. Major obstetric intervention (MoI) rate, calculated by dividing the number of deliveries through a surgical intervention by the total number of deliveries over a defined period of time, can be used as an indicator of health service utilization by parturient women.

This study was therefore undertaken to estimate the extent of unmet obstetric need in Turkana district in the north-western Kenya through comparison of surgical intervention rates between the refugees and local populations.

MATERIALS AND METHODS

This was a descriptive bi-directional study that employed both prospective and retrospective elements. The study population consisted of all pregnant women who received obstetric interventions during delivery in any of the hospitals in Turkana District, namely Lodwar District Hospital, Kakuma Mission Hospital and the Kakuma Refugee Camp hospital between January 1995 and September 1999 (a period of 4 years and 10 months). Using a standardized questionnaire, from maternity registers, case notes (inpatient files) and theatre registers by maternity ward nurses and trained medical records clerks, pertinent information was gathered on all obstetric surgical interventions, including caesarean sections, laparotomy, hysterectomy, craniotomy, embryotomy and internal version. Data on the indications for the interventions were also obtained from the case notes of the patients and counter-checked with theatre records. The study focussed on absolute maternal indications and those surgical interventions that were aimed at saving the mother's life.

Health care services in Turkana district are provided by four hospitals: Lodwar district hospital, Lokitaung sub-district hospital, Kakuma Mission hospital and Lokichogio Red-Cross hospital, seven health centres and 36 dispensaries. The utilisation of the facilities varies considerably, largely due to poor road network and the pastoralist nature of the population which is characterized by their seasonal mobility in search of water sources and grazing pastures for their animals. Surgical facilities are available at the Lodwar district hospital, Kakuma Mission Hospital and Lokichoggio Red-Cross hospital. Whereas the Lokichoggio hospital mostly serves emergency war-related trauma patients from southern Sudan, the Kakuma Catholic Mission hospital provides obstetric emergency care to the local population and women from the refugee camp who are usually referred from the camp hospital and paid for by the UNHCR. The International Rescue Committee (IRC) is the contracted agency responsible for the provision of curative and preventive health care services in the camp through the 46-bed hospital, four outpatient clinics and a number of community health workers.

Study setting: Kakuma refugee camp is situated in north-western Kenya, about 800 kilometres from the capital city Nairobi, and 100 kilometres from Lokichogio, the border town with Sudan. The camp is named after Kakuma village, originally used as a halting place for about 5,800 inhabitants, on the Nakuru-Lokichogio road. The district is situated on the border of Kenya and its three neighbouring countries with Uganda to the west, Sudan to the north and Ethiopia to the east. It covers an area of 77,000 sq. kilometres and is very sparsely populated. The ethnic composition of the district's population is very homogenous: over 95% of the population belongs to the Turkana group, characterised by their pastoral and nomadic way of life. Kakuma Division, located on the north-west, is one of the eight administrative divisions of the district. In 1996, the division had an indigenous population of 18,324 inhabitants distributed over 17,510 square kilometres. The arrival of over 45,000 refugees in 1991 in an area where water and vegetation are scarce put extra strain on the social and physical environment. The current refugee population is approximately 85,000.

The district's climate is arid and hot. The annual rainfall is low and varies with altitude, being lowest (180mm) in the central plains around Lodwar, and highest (520mm) in the north-west around Lokichoggio. The rain usually comes in two seasons: long rains in April-August, and short rains in November. In the dry season, the plains are almost bare of ground vegetation. Temperatures are high and fairly uniform throughout the year with an average daily level of between 25 and 38° C.

Topographically, a vast part of the district is a low-lying

plain from which protrude isolated mountains and ranges of hills. The plains are transversed by numerous shallow valleys which transform into seasonal rivers when it rains. Due to the rough terrain, roads are poorly developed and communication around the district is extremely difficult.

The Kakuma camp is fairly old and has a well-developed infrastructure comprising schools, workshops, dispensaries and a hospital. Over the years, an informal sector consisting of shops, markets, hotels and craftsmen has emerged. The location of the camp in the immediate proximity of the Turkana settlements and the Kakuma Township has resulted in intensive interactions between the refugees and the local population.

Nearly all obstetric surgical interventions for the rest of the district's population are handled at the Lodwar district hospital. The hospital, equipped with a small surgical theatre, maternity, obstetric, paediatric, female and male adult wards, is manned by two general medical officers and a number of nurses. There are no other doctors or private clinics in Lodwar town.

The data collected were analysed by key variables such as hospital of attendance, national status of the woman (whether a refugee or Kenyan) and area of residence (rural, urban or refugee camp). EPI-INFO software was used for coding, entering, cleaning and doing frequency distribution analysis of the data. Subsequent statistical analyses were done using SPSS version 9.0.

RESULTS

The demographic characteristics of women, who delivered during the period studied, from the two populations, were similar with respect to their mean age and parity (Table 1).

Table 1

Characteristics of women who delivered at Lodwar and Kakuma Hospitals, 1995-1999

		Host population	Refugees
Age(yrs):	mean	23.4 (n=174)	23.6 (n=137)
	range	13-42	15-36
Parity:	mean	1.6 (n=183)	1.4 (n=154)
	range	0-8	0-9

NB: The value of n is variable because information on age and parity was not consistently recorded.

Indications for surgical obstetric interventions: Maternal indications were the primary reason for caesarean sections, the only major surgical obstetric intervention performed, in women from both populations. The c/s rates were fairly similar: 85.4% for refugees and 87% for the host population (Table 2). The five most common maternal indications for c/s were CPD (38.7% versus 34.3%), previous caesarean section (18.6% versus 15.7%), poor uterine contractions (8.7% versus 17.2%), breech presentation (7.7% versus 14.2%) and pre-eclampsia (5.7% versus 8.2%). As can be seen, there were significantly greater c/s due to antepartum haemorrhage among the local women (8.8% vs. 1.5%; p=0.005) which can be attributed to a number of system factors such as inability to correctly identify the problem and use of traditional delivery methods. On the other hand, excess c/s due to breech presentation, poor

Table 2

Maternal indications for Caesarean sections

Indication	Host population		Refugees		Total		Difference
	No.	%	No.	%	No.	%	Chi- square
Ruptured /pre-ruptured uterus	8	4.1	6	4.5	14	4.3	N/S*
Antepartum haemorrhage due to placenta praevia /abruptio placenta	17	8.8	2	1.5	19	5.8	p=0.00
Cephalo-pelvic disproportion (CPD)	75	38.7	46	34.3	121	36.9	N/S
Transverse lie	5	2.5	1	0.5	6	1.8	N/S
Malpresentations (brow, POP, shoulder)	4	2.1	2	1.5	6	1.8	N/S
Breech	15	7.7	19	14.2	34	10.4	N/S
Previous c/s scar	36	18.6	21	15.7	57	17.4	N/S
Poor uterine contractions	17	8.7	23	17.2	40	12.2	p=0.02
Hypertension/eclampsia	11	5.7	11	8.2	22	6.7	N/S
Laceration (cervical, perineal tear)	1	0.5	2	1.5	3	0.9	N/S
Other conditions	5	2.5	1	0.5	6	1.8	
All cases	194	100	134	100	328	100	

* N/S difference not significant (p>0.05)

uterine contractions and hypertension/eclampsia were observed among the refugee women. These findings probably reflect differences in the quality of monitoring of early labour, ability to make the correct diagnosis and timelines of referral for emergency care.

The numbers and frequency distribution of foetal indications, shown in Table 3, are fairly comparable in the two populations. Foetal distress (82.8% versus 95.7%) and cord prolapse (13.8% versus 4.3%) were clearly the main reasons for caesarean section, in cases where foetal condition was the primary indication in the host and refugee populations, respectively. These proportions were not statistically different in the two populations.

Table 3

Foetal indications for caesarean section

Indication	Host pop.		Refugees		Total	
	No.	%	No.	%	No.	%
Fetal distress	24	82.8	22	95.7	46	88.5
Cord prolapse	4	13.8	1	4.3	5	9.6
Hydrocephalus	1	3.4	0	0	1	1.9
Total	29	100	23	100	52	100

Major Obstetric Intervention (MOI) rates: Data on all delivery events among the encamped refugee women were obtained from the maternity register at the Refugee Camp Hospital. The number of home deliveries and women referred to Kakuma Mission Hospital and Lodwar District Hospital for surgical delivery were also obtained from maternity registers, case files and theatre registers of the hospitals. The data are summarised in Tables 4 and 5. For the refugee population, the overall c/s rates (due to both maternal and foetal indications) ranged from 2.3% to 4.8% of the total deliveries recorded, with an average of 3.1% over the period of review. However, when the maternal indications only were considered, the mean c/s rate was 2.5%

Table 4

MOI rates for refugee women who delivered between January 1996 and September 1999

Year	Place, Type and Number of Births			
	Home (%)	Hospital		Total
	Normal*	Normal*	C/S** (%)	
1996	545 (58.8)	360	21 (2.3)	926
1997	509 (58.6)	332	27 (3.1)	868
1998	972 (66.8)	451	33 (2.3)	1456
1999 (Jan-Sept)	656 (63.7)	324	50 (4.8)	1030
Overall	2682 (62.7)	1467	131(3.1)	4280

* spontaneous vaginal delivery
** rate for all indications (maternal and foetal)

Most Turkana women normally deliver at home, and for this purpose many traditional birth attendants (TBAs) have been trained (personal communication- District Public Health Nurse). It is estimated that only about 30% of all deliveries take place in health facilities. The Lodwar District Hospital handles the bulk of hospital deliveries, representing approximately 20% of the total in the district, leaving another 10% who deliver in health centres and other facilities. Given the general lack of accurate records of home deliveries, which comprise approximately 70% of all births, the total number of births in the district was estimated using the hospital data as shown in Table 5.

Table 5

Estimated MOI rates for the host population in Turkana District, January 1996 - September 1999.

Year	Place, Type and Number of Births		
	Births at Lodwar hospital		Estimated total [(a+b)x 1 00/20]
	Normal[a]	C/S[b] (% of total)*	All deliveries
1996	410	43 (1.9)	2265
1997	369	50 (2.4)	2095
1998	318	42 (2.3)	1800
1999 (Jan-Sept.)	269*	25 (1.7)	1470
Overall	1466	160 (2.1)	7630

* rate for all indications (maternal and foetal)

Of the estimated 7,630 deliveries that occurred in the district over the period examined, only 160 were by caesarean section, representing an overall rate of 2.1%; and 1.7% where maternal indications were the primary reason. It is therefore evident that caesarean section rates were higher for refugee women than for the host population (3.1% vs. 2.1%). The likelihood of a refugee woman being operated on during childbirth was significantly greater than that for a woman from the local population (OR=1.73; 95% CI, 1.4-2.14). This can be attributed to the availability of adequate obstetric care personnel and facilities at the camp for accurate evaluation of pregnancy, monitoring of early labour, early identification of problems in delivery and timely referral to the Mission hospital for emergency surgical intervention.

Caesarean section rates for hospital deliveries: For all indications, the frequency of caesarean sections was slightly greater among the local women admitted at the Lodwar district hospital (9.8%) than that for refugee women (8.2%) (Table 6). Although, the differences are not statistically significant, the higher c/s rate for the local population may imply that most women who seek delivery in the hospital are a selected population with serious obstetric problems that are likely to result in a surgical delivery, and are possibly referred by traditional birth attendants.

Unmet obstetric needs: Using the caesarean section rate for absolute maternal indications in the refugee population (2.5%) as a reference, it was estimated that at least 0.8% (2.5%-1.7%) of parturient women from the local population who required c/s failed to access the

services. This translates to at least 61 pregnant women who most likely died or experienced severe birth-related complications as a result of unmet obstetric need over the period of three years and nine months examined. In other words, on the basis of these data, at least 16 avoidable maternal deaths and/or complicated deliveries occur annually in Turkana district.

Outcomes of Caesarean sections: As illustrated in Table 7, the outcomes of surgical delivery for both mother and baby were much better among the refugee population. No maternal deaths were reported among the refugee women operated, whereas four local women died. Of the four maternal deaths, in three cases, both mother and child died during caesarean section. Stillbirths were also more common in the host population (12.6% versus 9.6%), reflecting a better child survival rate (89.8%) in refugees than in the host population (78%), although the differences were not statistically significant at the p-level of 0.05 (OR=1.51; 95% CI, 0.74-3.1).

Table 6

Frequency of Caesarean sections by place of delivery

Year	Caesarean sections as percentage of total obstetric admissions	
	Kakuma Mission Hospital	Lodwar District Hospital
1996	5.5	9.5
1997	7.5	11.9
1998	6.8	11.7
1999	13.4	8.5
Mean rate	8.2	9.8

Table 7

Maternal and foetal outcomes of Caesarean sections

	Outcome	Refugees (n=157)	Host population (n=223
Mother:			
	Well	156 (99.4%)	198 (88.8%)
	Dead	0	4 (18%)
	Unknown	1	21
Child:			
	Well	141 (89.8%)	174 (78.0%)
	Dead (SB)	15 (9.6%)	28 (12.6%)
	Unknown	1	21

Table 8

Comparison of foetal outcomes by distance to health facility

Distance	Outcome		Total*
	Alive and well	Dead	
0-9 km	257 (90.5%)	27	284
10 km +	54 (80.6%)	13	67
Total	311	40	351 (OR=2.29;p=0.02)

* Excludes 30 cases with incomplete data

Effect of distance on pregnancy outcome: The effect of accessibility to emergency obstetric care was assessed by making comparisons between distance to the hospital and intervention outcomes for mother and child. Of the 284 births by women living within a distance 10 kilometres from the hospital, 90.5% were well babies, whereas only 80.6% of babies born to women from far flung locations (10 Km and greater), were alive and well. As shown in Table 8, the likelihood of child survival was significantly greater for those living within 10 km of the hospital (OR=2.29; 95% CI=1.04-4.99). It is worthy noting that all the three cases in which both mother and child died came from far areas, over 40 km from the hospital.

Of the women from the host population who sought obstetric care at the hospital, maternal deaths were greater among those from rural areas (5.7%) than urban residents (0.7%). The number of stillbirths was also greater among rural-based women (24%) than those living in urban settings (10.1%): Odds ratio 2.8 (95% CI, 1.15-6.9). These differences can be explained by lack of obstetric care services in the vast rural areas of the district, and in contrast, the easy and timely access to hospitals by women living in urban areas.

Length of stay: As a measure of hospital utilization associated with surgical obstetric interventions, the length of hospital stay was computed. Striking differences were observed between the two populations: on average, refugee women who delivered by c/s were hospitalised for a shorter duration (8.15 days) than women from the host population (11.3 days). At the same time, the mean length of stay for all women who had c/s at Kakuma Mission Hospital (8.4 days) was considerably less than those operated on at the Lodwar District Hospital (13.4 days), with the T-test for ANOVA being significant (F=90.0; p=0.000). These figures reflect differences in the quality of services provided at the two hospitals.

DISCUSSION

Methodological assessment: Major obstetric intervention (MOI) rate is calculated by dividing the number of deliveries by major obstetric intervention by the total number of deliveries in a defined population over a defined period of time. It can thus be used as an indicator of utilization of health services by parturient women with absolute indications for surgical delivery. MOI rate can also provide an indirect measure of development of infrastructure, such as communication network, health care facilities, accessibility to and quality of maternal health services offered. The absolute maternal need during delivery should therefore be seen as an indicator or tracer measure of the availability of, and accessibility to a range of obstetric care services for women in a specified sub-population or geographical region of a country.

Whereas assessment of MOI rates can be fairly simple, the methodology is prone to a number of limitations, especially in relation to ascertaining the accuracy of numerator and denominator. The major potential sources

of error include misinterpretation of indications or variability in the diagnosis for a surgical intervention, under-recording of obstetric interventions performed and lack of accurate data on the denominator (total number of live births). These factors may have contributed to either under or over-estimation of MOI rates. However, reasonable efforts were taken to minimise the errors. For instance, midwives and theatre personnel with obstetric experience were recruited as data collectors; and the principal investigator (WO) counterchecked each record (with both maternity and operating theatre registers) and verified the information pertaining to every subject.

Major obstetric interventions: Globally, approximately 585,000 women die each year from pregnancy-related causes, 80% of these are directly due to obstetric causes such as dystocia, haemorrhage and hypertension. Up to 95% of these deaths are avoidable through timely and appropriate obstetric interventions. A certain proportion of parturient women have absolute indications for surgical delivery, which, if not undertaken, will result in the death of the woman (and child). The frequency of caesarean sections in a number of African countries varies from 1% to 5% (11-13), and there are considerable differences between urban and rural residents. A low MOI rate (of less than 1%) is most probably not sufficient to cover the associated delivery and postpartum problems often experienced by women in a given area or health facility.

The two populations of women examined in this study have fairly similar maternal indications for caesarean sections, the major ones being cephalo-pelvic distortia, previous c/s scar, poor uterine contraction, breech presentation and ante-partum haemorrhage. One would expect that proportions of the women that actually delivered by obstetric surgical intervention would also be similar among the refugee and host populations. This, however, was not the case. Caesarean section rates were found to be significantly higher among the encamped refugee parturient women than for the local Turkana women, and the birth outcomes were also better for refugees. These differences can be attributed to a number of factors: for example, for the Turkana population, it is clear that due to poor communication infrastructure, the general under-development and inadequate health facilities and trained staff, patients often arrive late to hospital after prolonged labour. The lack of timely recognition of birth-related problems and use of traditional approaches of delivery may have further aggravated a woman's condition. On the other hand, the refugee camp is well endowed with health care facilities, supplies and personnel. Pregnancy evaluation, recognition of obstetric problems, referral and initiation of appropriate intervention are more efficient and timely. Accessibility to health care of fairly good quality is guaranteed. It is therefore likely that a number of Turkana women die at home during childbirth or on their way to hospital. The marked differences in caesarean section rates, maternal deaths and stillbirths between rural and urban residents further indicate that there are serious problems with access to the hospital care for the local population. Apart from service-related factors inherent inherited differences such as pelvic dimensions and sizes of babies could act as confounders in this study and would need to be taken into consideration.

In this study, at least 61 women are estimated to have died during delivery as a result of failing to access a hospital for caesarean section, in excess of the numbers expected had the rates been similar to that of the refugees. This figure reflects the magnitude of unmet obstetric needs in the area, which is avoidable through provision of the services. The encamped refugees with parallel health care services are clearly far much better off than their hosts, a situation that is contributing to the increasing tension and conflicts between the two populations.

Implications for planning and policy: There is evidence that obstetric care services for encamped refugees are better than those for the host population, and that unmet needs for pregnant women in Turkana district remains high: annually at least 16 women with complicated births die due to failure to access appropriate emergency obstetric services. These deaths could be avoided through a number of strategies that improve access to, and quality of obstetric care, such as improving communication infrastructure and transportation to hospitals, building smaller hospitals in geographic areas with population settlements and providing them with sufficient medical personnel, supplies, equipment and ambulances.

The magnitude of unmet obstetric needs in Turkana district remains high, and needs urgent attention by the government and other health-related agencies. Although this is a complex problem, given the general lack of infrastructure, harsh climatic conditions and the poor socio-economic status of the population, there is need for major political commitment to the overall development of the region coupled with a major overhaul of the health care delivery system.

Resources available for refugee health care should also benefit the local population. For this to have a meaningful impact, refugees should be settled in smaller groups, integrated with the local population, to facilitate the sharing of health care and other services. Any external or humanitarian assistance given to refugees should not be limited to refugees alone. The experience reported by Van Damme(11) in Guinea demonstrates that refugee assistance health programmes can improve access to and quality of health care to host populations, if integrated with the local health services. The national policy on refugee settlement should therefore recognise the specific obstetric needs of all women, and guarantee equal opportunities for accessibility to quality health care services.

Implications for future research: It is known that most of the health personnel working in the refugee health facilities are drawn from the host population. Some are from the surrounding hospitals. One may have a higher provider: population ratio in the refugee camps than in the local hosting district. What impact this 'brain drain' has on

the local health services and on the health status has not been documented and needs to be studied.

The differential effects on refugee health status of the various approaches of resettling refugees: the directive encampment approach as used in Kenya, the non-directive free settlement approach used in Guinea and in other countries like Uganda have not been studied. There is need for more research to improve the understanding of the health impacts of these approaches.

Further research is needed to elucidate the role of the various non-service factors in explaining the observed differences.

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